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Field Efficacy and Phytotoxicity Evaluation of Metiram 70 % WG Against Tikka Disease in Groundnut

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ABSTRACT

A field experiment was conducted during *Kharif*-2017 comprising six treatments which replicated four times under farmer's field. During the current study an attempt was made to evaluate different doses of Metiram 70 % WG for effective management of Tikka leaf spot disease of Groundnut. The results from field experiment showed that, spraying of Metiram 70 % WG @ 2500 g/ha was found effective in registering the lowest leaf spot severity of 14.81 Percent Diseases Index (PDI) which was on par with Metiram 70 % WG @ 2000 g/ha of both market sample (15.03 PDI) and test sample (16.47 PDI). Data pertaining to percent disease control over untreated check was observed higher in Metiram 70 % WG @ 2500 g/ha (78.32 %). The highest pod yield was documented in plots applied with Metiram 70 % WG @ 2500 g/ha (3016.06 kg/ha) followed with Metiram 70 % WG @ 2000 g/ha of both market sample (2934.82 kg/ha) and test sample (2957.75kg/ha). In perusal of information generated in the present investigation it is envisaged that, spraying of Metiram 70 % WG @ 2500 or Metiram 70 % WG @ 2000 g/ha were found to be effective dose of fungicides in the management of the disease under field condition as well as successfully suppressed the secondary spread after resorting curative measures.

Key words : *Field efficacy, Groundnut, Metiram, Phytotoxicity, Tikka disease*

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the most promising oilseed crops of the world as well as India (Mensah and Obadoni, 2007). Groundnut is one of the major oilseed crops grown in India accounting for 32% of oil seed area and 39% of oil seed production (Ghenvande and Nanda Gopal, 1997). Total area under groundnut cultivation in India was 41.52 lakh ha which accounts for total production of 70.77 lakh tones with productivity of 1704 kg/ha potential. Among the major groundnut growing states, Gujarat alone accounted for 39.1% of the national acreage. Groundnut was grown nearly about 16.25 lakh hectares with 30.54 lakh tones production and productivity of 1,879 kg ha^{-1} (Anon., 2018). The productivity in Karnataka is very lesses compared to other producing states, this might be due to the lower yield. The main yield constraints are occurrence of diverse pests and diseases, among many reported diseases early leaf spot (*Cercospora arachidicola*) and late leaf spot (*Cercosporidium personatum*) are more prevalent and destructive in nature. The latter two diseases together are referred to as Tikka disease of groundnut.

Groundnut cultivation normally suffers with leaf spot known as "Tikka" disease that appears during warm and humid *Kharif* season (Jha *et al.*, 2013).

Early leaf spot (*Cercospora arachidicol*a) and late leaf spot (*Phaeoisariopsis personata*) are major destructive disease of groundnut production due to defoliation of leaves (Culbearth, 2000) and caused 50% or more reduction in pod yield (Thakur *et al*., 2013). Tikka diseases can cause yield losses up to 70% (Grichar *et al.,* 1998; McDonald *et al.,* 1985; Miller *et al.,* 1990) resulting in a lower productivity of the crop. Avoidable losses up to 45 % due to Tikka, up to 42 % due to rust and up to 60 % due to both have been reported in Karnataka (Siddaramaiah *et al*., 1983). The only effective means of management of this disease is by the use of fungicides and several fungicides have been tried and found effective against this disease. A number of fungicides were evaluated and found effective against Tikka disease of groundnut in the country (Naidu and Rao, 1997; Tiwari *et al*., 2004). Therefore, in the present study different concentration of Metiram 70 % WP was evaluated under field condition to generate information on the management of Tikka disease of groundnut.

Materials and Methods

Characterization of experiment and treatments

The comparative efficacy of Metiram 70 % WG at different doses against Tikka disease of groundnut was laid out in Randomized Block Design (RBD) with five treatments and four replications on groundnut in farmers field at Chikadadakatte village of Honnali taluk, Davanagere district under the direct supervision of scientist from University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka. Gross plot size of 5 meter×5 meter and a net plot size of 3.5 meter×3.5 meter with a spacing of 30×10 cm were maintained during the experimentation. The soil of the field was sandy loam and well drained, field was prepared by ploughing thrice and leveling. The seeds were sown in plots as per the layout along with the recommended dosage of fertilizers. The plants were supplied with organic fertilizers in the form of vermicompost and inorganic chemical fertilizers as per recommendations mentioned in Package of Practices of University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka. The details of treatments are furnished below,

Scheduling of treatments

All the treatments each being comprised of two sprays were imposed after the appearance of the disease initiation at 15 days interval. The treatments were initiated from the Disease appearance stage (DAS) of leaf spot, first spray was taken on 02.08.2017 and Second spray was given 15 days after first spayed, i.e. on 17.08.2017. The required quantity of fungicide as per requirement was measured out/weighed with measuring cylinder/balance and suitably dissolved in a requisite quantity of water to obtain spray solution of desired concentrations. Knapsack sprayer with hollow one nozzle was used for spraying.

Determination of per cent disease index (PDI)

The observations on per cent disease severity were

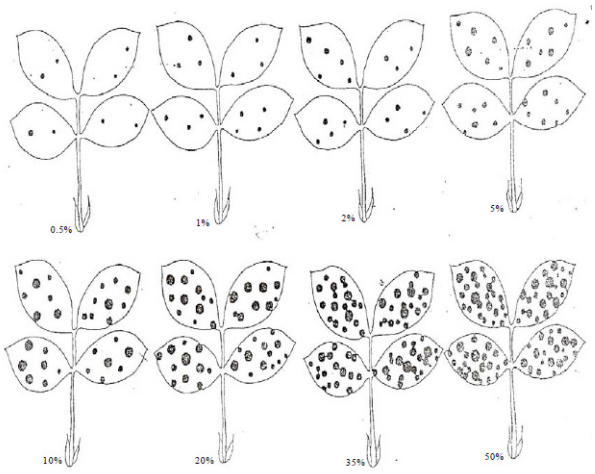

Fig. 1. Standardized pictorial chart exhibiting per cent necrotic area caused by Tikka disease

Treatment No.	Treatment details	Formulation Dose (g/ha)	Dilution in water (l/ha)
1	Metiram 70 % WG	1500	500-750
2	Metiram 70 % WG	2000	500-750
3	Metiram 70 % WG	2500	500-750
4	Metiram 70%WG (Market sample)	2000	500-750
5	Control		500-750
6	Metiram 70 % WG (only for phytotoxicity)	4000	500-750

Scale (0-9) used for scoring of leaf spot infection on ground nut crop

Leaf spot score	No symptom on the leaf	Disease severity (%)
1	Lesions largely on lower leaves; no defoliation	0
2	Lesions largely on lower leaves; very few lesions on middle leaves; defoliation of some leaflets evident on lower leaves	1-5
3	Lesions largely on lower leaves; very few lesions on middle leaves; defoliation of some leaf lets on lower leaves	6-10
4	Lesions on lower and middle leaves, but severe on lower leaves; defoliation of some leaflets evident on lower leaves	11-20
5	Lesions on all lower and middle leaves; over 50% defoliation of lower leaves	21-30
6	Lesions severe on lower and middle leaves; lesions on top leaves but less severe; extensive defoliation of lower leaves; defoliation of some leaflets evident on middle leaves	31-40
7	Lesions on all leaves but less severe on top leaves; defoliation of all lower and some middle leaves	41-60
8	Defoliation of all lower and middle leaves; lesions severe on top leaves and some defoliation of top leaves evident	61-80
9	Defoliation of almost all leaves leaving bare stems; some leaflets may be present, but with severe leaf spots	81-100

recorded at pre treatment and 15 days after each spray. The disease severity in respect of Tikka leaf spot was recorded using 0-9 scale given by Subrahmaynam *et al.* (1995) which was furnished in Fig. 1. Similarly, percent disease index (PDI) was calculated by using following formula proposed by Wheeler (1969)

$$\text{Formula for Percent disease index} = \frac{\text{Sum of the individual disease rating}}{\text{Total no. ofleaves observed}} \times \frac{100}{\text{Maximum disease grade}}$$

Evaluation of Phytotoxic effect on plants

The observations were recorded for the visual phytotoxicity symptoms like leaf injury on tips/ surface, wilting, vein clearing, necrosis, epinasty and hyponasty on 1, 3, 7, 10 and 15 days after each spraying. Leaf injury on tips/ surface was recorded by following 0-10 rating scale as detailed below.

Phytotoxicity rating scale	Phytotoxicity (%)
0	0-00 % area covered
1	1-10 % area covered
2	11-20 % area covered
3	21-30 % area covered
4	31-40 % area covered
5	41-50 % area covered
6	51-60 % area covered
7	61-70 % area covered
8	71-80 % area covered
9	81-90 % area covered
10	91-100 % area covered

Yield per plot

Data on yield parameters like pod yield was recorded after allowing the pods to dry in sun for ten days after the harvest. Ground nut pod yield was recorded from each harvest and pooled to get mean yield and converted to kg/ha.

Statistical analysis

The observations were recorded on percent disease index (PDI) was after two sprays. The data were suitably transformed and analyzed statistically. The pod yield obtained in each treatment was recorded at harvesting stage and extrapolated the yield in terms of kilograms per hectare and analyzed statistically.

Results

Effect of Metiram 70% WG on Tikka leaf spot disease

The data on the disease severity at farmer's field during the year 2017 (Table 1) indicated that, the disease severity was negligible before treatment imposition and there was no statistical difference among the treatments in evaluated year. However, as the age of the crop started increasing, the disease severity showed increasing trend in untreated plot. It was observed that, all the treatments checked the further spread of disease severity and low level of leaf spot indices were recorded after successive sprays. The pretreatment observation was recorded

from the range of 31.40 to 35.97 PDI. The Metiram 70 % WG @ 2500 g/ha was found effective in reducing the Tikka leaf spot disease at 15 DAT after first spray (23.29 PDI) which was followed by Metiram 70 % WG @ 2000 g/ha of both market sample (26.73 PDI) and test sample (25.95 PDI), which were statistically at on par. whereas control plot observed the highest percent disease index (44.44 PDI) (Table 1) and (Figure 1).

After second spray, the lowest leaf spot severity was observed in Metiram 70 % WG @ 2500 g/ha (14.81 PDI) for 15 days after second spray which showed on par result with Metiram 70 % WG @ 2000 g/ha of both market sample (15.03 PDI) and test sample (16.47 PDI). Whereas control plot observed the highest percent disease index (68.33 PDI).

Data with respect to percent disease control over untreated check was observed higher in Metiram 70 % WG @ 2500 g/ha (78.32 %) which was followed with Metiram 70 % WG @ 2000 g/ha of both market sample (78.00 %) and test sample (75.90 %) whereas, lowest was documented in untreated check.

Pod yield

Data pertaining to pod yield indicated that, the highest fruit yield of 3016.06 kg/ha was recorded with spray treatment of Metiram 70 % WG @ 2500 g/ha, which was followed with Metiram 70 % WG @ 2000 g/ha of both market sample (2934.82 kg/ha) and test sample (2957.75kg/ha). The lowest yield was observed in control plot (2189.75 kg/ha).

Phytotoxicity

The of Metiram 70 % WG sprayed at different doses *viz*., 2000, 4000, g/ha did not show any visual symptoms of phytotoxicity like leaf injury on tips/ surface, wilting, necrosis, vein clearing, epinasty and hyponasty (Table 2). Hence Metiram 70 % WG was non phytotoxic to ground nut up to a level of 4000 g/ha.

Discussion

In perusal of current findings it is envisaged that, curative spraying of Metiram 70 % WG @ 2500 g/ha or Metiram 70 % WG @ 2000 g/ha was found to be effective in reducing severity of Tikka leaf spot disease and secondary spread of the disease under field condition with increased yield and per cent disease control over untreated check. Similarly, efficacy of Metiram 75 % WP against early and late leaf spots of groundnut has also been reported in Northern Ghana (Nutsugah *et al*., 2007). They found that when Metiram applied alone was effective in reducing leaf spot severity and it yielded significantly higher biomass and pod yields compared to most of the treatments.

Subsequently, Hossain and Rahman (2007) reported in their studies on the efficacy of the foliar spraying of potash (K2O), neem leaf extract (*Azadirachta indica*) and carbendazim with metiram against early leaf spot (*C. arachidicola*), late leaf spot (*P. personata*) and rust (*P. arachidis*) of groundnut under field conditions obtained significant reduction with carbendazim + metiram. Moraes *et al*. (2001) evaluated the efficiency of fungicides (chlorothalonil, tebuconazole, difenoconazole and propiconazole) for the control of late leaf spot

Table 1. Efficacy of Metiram 70%WG against Tikka leaf spot disease on groundnut

SL. No.	Treatments (g/l)	Tikka leaf spot (PDI)*				Pod Yield (kg/ha)
		Pre treatment Observation	15 days after I spray	15 days after II spray	Percent control over untreated check	
1	Metiram 70 % WG @1500	31.40 (34.09)**	27.76 (31.81)	20.51 (26.94)	69.98	2314.25 (48.11)***
2	Metiram 70 % WG@2000	33.18 (35.19)	25.95 (30.64)	16.47 (23.95)	75.90	2957.75 (54.39)
3	Metiram 70 % WG@2500	35.97 (36.87)	23.29 (28.87)	14.81 (22.63)	78.32	3016.06 (54.92)
4	Metiram 70 % WG @2000 (market sample)	34.18 (35.78)	26.73 (31.15)	15.03 (22.82)	78.00	2934.82 (54.18)
5	Untreated Check	32.52 (34.79)	44.44 (41.83)	68.33 (55.78)	-	2189.75 (46.80)
	S.Em±	-	0.57	0.54	-	0.51
	CD@0.05 %	NS	1.77	1.66	-	1.62

*PDI- Per cent disease index (Mean of four replications)

** Values in the parentheses are arc sine transformed values.

*** Figures in parenthesis are square root transformation values

Table 2. Phytotoxic effect of Metiram 70% WG on groundnut crop

Treatments (ml/ha)	Symptom	Pre-count	Post treatment observations*									
			I spray (days after)					II spray (days after)				
			1	3	7	10	15	1	3	7	10	15
Metiram 70%	Leaf injury	0	0	0	0	0	0	0	0	0	0	**0**
WG @	Wilting	0	0	0	0	0	0	0	0	0	0	**0**
2000g/ha	vein clearing	0	0	0	0	0	0	0	0	0	0	**0**
	Necrosis	0	0	0	0	0	0	0	0	0	0	**0**
	Epinasty	0	0	0	0	0	0	0	0	0	0	**0**
	Hyponasty	0	0	0	0	0	0	0	0	0	0	**0**
Metiram 70%	Leaf injury	0	0	0	0	0	0	0	0	0	0	**0**
WG @	Wilting	0	0	0	0	0	0	0	0	0	0	**0**
4000g/ha	vein clearing	0	0	0	0	0	0	0	0	0	0	**0**
	Necrosis	0	0	0	0	0	0	0	0	0	0	**0**
	Epinasty	0	0	0	0	0	0	0	0	0	0	**0**
	Hyponasty	0	0	0	0	0	0	0	0	0	0	**0**
Untreated	Leaf injury	0	0	0	0	0	0	0	0	0	0	**0**
Check	Wilting	0	0	0	0	0	0	0	0	0	0	**0**
	vein clearing	0	0	0	0	0	0	0	0	0	0	**0**
	Necrosis	0	0	0	0	0	0	0	0	0	0	**0**
	Epinasty	0	0	0	0	0	0	0	0	0	0	**0**
	Hyponasty	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

caused by *Cercosporidium personatum* infection on groundnut cv. Tatu. in Brazil. They found that the triazole fungicides were more efficient than chlorothalonil. Tebuconazole greatly reduced late leaf spot intensity. Nath *et al.* (2013) reported the efficacy of tebuconazole against late leaf spot disease of groundnut as this fungicide could reduce the disease intensity in the field by 52.42% and resulted in increased yield by 67%. The fungicide carbendazim was found effective in reducing leaf spot or tikka disease intensity caused by *Cercospora arachidicola* and *Cercosporidium personatum* and realizing maximum pod and haulm yield for the management of leaf spot disease of groundnut (Hossain and Hossain, 2014; Naveen Kumar *et al.*, 2014).

Conclusion

The present findings indicated that, the Metiram 70 % WG @ 2000g/ha were as highly effective for Tikka leaf spot disease in ground nut with increased economic yield without showing any phytotoxicity to the crop. Hence, Metiram 70 % WG @ 2000g/ha may be recommended for the management of Tikka leaf spot disease in groundnut.

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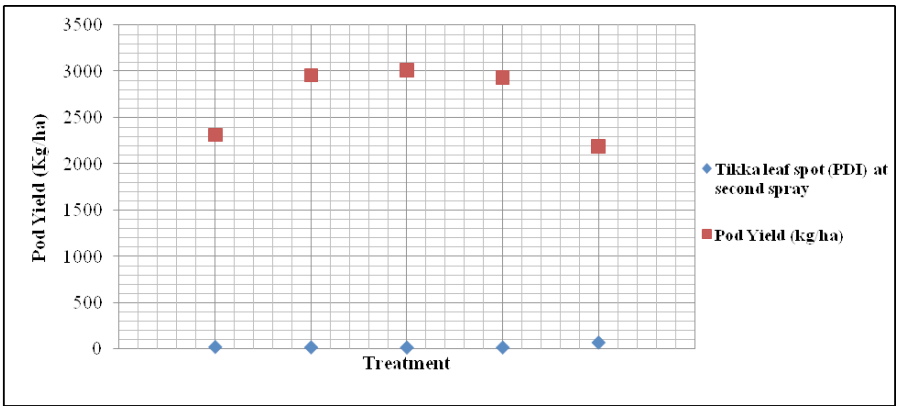

Fig. 1. Efficacy of Metiram 70%WG against Tikka leaf spot disease on groundnut

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